



U.S. Department of Energy  
Federal Energy Technology Center

## CLEAN AFFORDABLE POWER

- ☒ fossil energy
- ☐ environmental
- ☐ energy efficiency
- ☐ other

M99000294 P6.5

## RVS-1 DESULFURIZATION SORBENT WITH McDERMOTT TECHNOLOGIES FUEL CELL DEVELOPMENT

### States Impacted:

Ohio, Virginia, West Virginia,  
Kentucky, North Carolina

### Benefit Areas:

Environmental, Cost Savings,  
Energy Security

### Participants:

McDermott Technologies, Inc.;  
US DARPA; US ARO; Ballard  
Power Systems; United  
Catalyst, Inc.; Federal Energy  
Technology Center; Gibbs &  
Cox; Research Triangle  
Institute

### FETC Contact:

Daniel Cicero\*\*

Office: (304) 285-4826

E-Mail: [dcicer@fetc.doe.gov](mailto:dcicer@fetc.doe.gov)

### MAIL ADDRESS:

\* U.S. Department of Energy  
P.O. Box 10940  
626 Cochran's Mill Road  
Pittsburgh, PA 15236-0940

\*\*U.S. Department of Energy  
P.O. Box 880  
3610 Collins Ferry Road  
Morgantown, WV 26507-0880

### WEBSITE:

[www.fetc.doe.gov](http://www.fetc.doe.gov)

### Description

Fuel cells for shipboard applications – a Ship Service Fuel Cell generator – are the focus of an effort between the Office of Naval Research and The Naval Sea Systems Command and McDermott Technology, Inc. (MTI). The technology uses hydrogen to produce electricity by an electrochemical reaction, which releases near-zero pollutants thanks to the use of a FETC-developed desulfurization sorbent.

Under joint MTI and FETC sponsorship, the Research Triangle Institute conducted laboratory-scale testing, and the results showed its capability in reducing sulfur concentration. The sorbent does not degrade and it can be regenerated.

As a result, FETC's RVS-1 sorbent has been incorporated into the 2.5 kWe fuel cell designs. FETC has licensed RVS-1 sorbent to United Catalysts, Inc., of Louisville, Kentucky, for manufacture and commercial sales.

More than \$1 million of Phase I funding is going toward developing the critical naval distillate fuel reformer to be performed at the MTI research facility in Alliance. This processing component is key to integrating fuel cells into the Navy without the need to change its fuel supply infrastructure. The 2.5-megawatt SSFC power plant conceptual design effort is being done at the Naval Nuclear Fuel Division of BWXT in Lynchburg, Virginia. This design effort will confirm the size, weight, efficiency, reliability, and transient response capabilities of the SSFC power plant. Overall program management will be supplied by BWXT. Ballard Power Systems, a leading developer of proton-exchange membrane (PEM) fuel cell technology, will supply the fuel cells.

### Goals

The Navy's program is a three-year effort to evaluate fuel cells for shipboard power. MTI is one of two companies selected to perform the first phase of the effort. MTI, teamed with fellow McDermott subsidiary BWX Technologies, independent fuel cell supplier Ballard Power Systems, and naval architect Gibbs & Cox, to design a 500-kWe SSFC power plant, including key subsystems: a fuel reformer, fuel cells, and a gas purifier.

### Tangible Benefits

**National:** Several studies by the U.S. Navy and others have identified PEM fuel cells as a viable choice for near-term shipboard and transportation applications. In parallel with PEM fuel cell technology, heavy hydrocarbon reforming technology allows efficient processing of military logistic fuels for use with fuel cells. MTI expects that these complementary technologies can be combined for a break-through in power plant technology and design.

**Regional/Local:** Fuel cell development, especially as it applies to power plant technology, provides environmental and cost savings benefits for entire regions.